

1 I CLAIM:

2 1. A method for providing a fertilizer to plant roots, comprising the steps of:
3 a. administering to the soil in which the plants grow, a plant soil fertilizer
4 composition; and
5 b. shielding the fertilizer from interference with any metal ions in the soil
6 in which the plants grow during said administration of the fertilizer to
7 the plant roots, thereby enhancing delivery of the fertilizer to the plant
8 roots.

9 2. The method of claim 1 wherein said fertilizer is shielded from interference with
10 said any metal ions in said soil by chelating said any metal ions.

11 3. The method of claim 1 wherein said fertilizer includes an acid, said acid
12 reacting with said any metal ions in said soil in which the plants grow, thereby
13 inhibiting any interference from said any metal ions in said soil in which the
14 plants grow and enhancing delivery of the fertilizer to the plant roots.

15 4. The method of claim 3 wherein said acid is an organic acid.

16 5. The method of claim 4 wherein said organic acid is selected from the group
17 consisting of an acid containing at least one carboxylic group, an aliphatic
18 acid, and an aliphatic multi-carboxyl acid.

19 ~~6. The method of claim 4 wherein said organic acid is citric acid.~~

20 7. The method of claim 5 wherein the fertilizer includes phosphate ions and the
21 molar ratio of citric acid concentration to the concentration of the phosphate
22 ions is about 0.125 to 8.0.

23 8. The method of claim 7 wherein said molar ratio is about 0.25 to 4.0.

24 9. The method of claim 7 wherein said molar ratio is about 0.25 to 2.0.

25 ~~10. The method of claim 3 wherein the fertilizer includes phosphorus.~~

26 11. The method of claim 3 wherein the fertilizer includes a soluble phosphate
27 compound selected from the group consisting of a polyphosphate compound
28 and an orthophosphate compound.

29 12. The method of claim 10 wherein said acid is selected from the group
30 consisting of phosphoric acid, phosphorous acid, an acid with a molecular

weight of not more than 400, a phosphorus-containing acid with a molecular weight of not more than 300, sulfuric acid, sulfurous acid, oxalic acid, and acetic acid.

9 13. The method of claim 3 wherein said acid is a sulfur-containing acid.

14. The method of claim 3 wherein the fertilizer includes metal ions, said acid reacting with said any metal ions in said soil in which the plants grow, thereby inhibiting any interference from said any metal ions in said soil in which the plants grow and enhancing delivery of the fertilizer metal ions to the plant roots.

15. The method of claim 14 wherein said acid is selected from the group consisting of phosphoric acid, phosphorous acid, an acid with a molecular weight of not more than 400, a phosphorus-containing acid with a molecular weight of not more than 300, sulfuric acid, sulfurous acid, oxalic acid, and acetic acid.

16. A plant fertilizer composition comprising an acid whereby said acid reacts with any metal ions in the soil in which the plants grow thereby shielding the fertilizer from interference with any metal ions in the soil and enhancing delivery of the fertilizer to the plant roots.

17. The composition of claim 16 wherein said acid is an organic acid.

18. The composition of claim 17 wherein said organic acid is selected from the group consisting of an acid containing at least one carboxylic group, an aliphatic acid, and an aliphatic multi-carboxyl acid.

19. The composition of claim 17 wherein said organic acid is citric acid.

20. The composition of claim 19 wherein the fertilizer includes phosphate ions and the molar ratio of citric acid concentration to the concentration of the phosphate ions is about 0.125 to 8.0.

21. The composition of claim 19 wherein said molar ratio is about 0.25 to 4.0.

22. The composition of claim 19 wherein said molar ratio is about 0.25 to 2.0.

23. The composition of claim 16 wherein the fertilizer includes phosphorus.

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32. The method of claim 32 wherein the fertilizer includes phosphate ions and the molar ratio of citric acid concentration to the concentration of the phosphate ions is about 0.125 to 8.0.
- 20
34. The method of claim 33 wherein said molar ratio is about 0.25 to 4.0.
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35. The method of claim 33 wherein said molar ratio is about 0.25 to 2.0.
36. The method of claim 30 wherein the fertilizer includes phosphorus.
37. The method of claim 30 wherein the fertilizer includes a soluble phosphate compound selected from the group consisting of a polyphosphate compound and an orthophosphate compound.
38. The method of claim 36 wherein said acid is selected from the group consisting of phosphoric acid, phosphorous acid, an acid with a molecular weight of not more than 400, a phosphorus-containing acid with a molecular weight of not more than 300, sulfuric acid, sulfurous acid, oxalic acid, and acetic acid.
39. The method of claim 30 wherein said acid is a sulfur-containing acid.
40. The method of claim 30 wherein the fertilizer includes metal ions, said acid thereby enhancing delivery of the fertilizer metal ions to the plant roots.
41. The method of claim 40 wherein said acid is selected from the group consisting of phosphoric acid, phosphorous acid, an acid with a molecular weight of not more than 400, a phosphorus-containing acid with a molecular weight of not more than 300, sulfuric acid, sulfurous acid, oxalic acid, and acetic acid.